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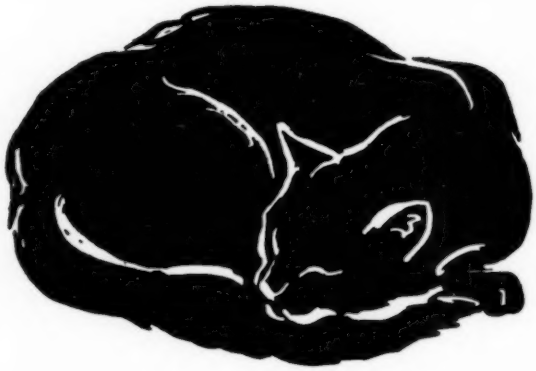

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Displacement of the Bovine Abomasum: A Review of 80 Clinical Cases

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Introduction

PERHAPS one of the most remarkable features of dairy practice in the last decade has been the apparent marked rise in the incidence of displacement of the abomasum of the dairy cow. When first reported by Begg (1950) and Ford (1950) there was no indication that within a few years this condition would prove to be one of the most common surgical conditions of the bovine alimentary tract. That this is now so is shown by the increasing number of clinical reports which have appeared in the last 10 years (Barret & Nicol, 1958; Begg, 1950; Begg & Whiteford, 1956; Butterfield, 1959; Cunningham, Jarret & McIntyre, 1959; Fincher, 1955; Ford, 1950; Hebeler, 1954; Jennings, 1957; Jones, 1959; Macleod, 1960; Marr & Jarret, 1955; Moore, Clark, Riley, Conner & Rines, 1955; Singleton, 1951; Steere & Nealy, 1958; Straiton & McIntee, 1959; Tutt, Richards & Yarrow, 1959; Williams & Lloyd, 1957a, 1957b; Williams, 1960; Wood, 1957; Wood & Allison, 1957).

The first of the present series of cases was seen at this animal hospital in 1955. Since then a further 79 cases have been dealt with. All cases were detained for several days, and the opportunity was taken to make a close study of the clinical features of the condition with special reference to diagnosis. Several operative techniques were used in treatment and an assessment made of the merits and demerits of each. This communication comprises a review of these experiences.

Incidence

All the cases reviewed were in high quality adult cows of the dairy breeds. Their ages varied from 2 to 10 years, there being no apparent special age incidence.

Table I illustrates the striking increase in the number dealt with annually since 1955. This is, no doubt, due largely to ever-increasing familiarity with the abnormality on the part of veterinary surgeons in practice as a result of the frequent reports of the condition which have been published in recent years.

TABLE I
THE NUMBER OF CASES OF DISPLACED ABOMASUM DEALT WITH IN THE YEARS 1955–61 SHOWING BREED INCIDENCE

Year	Friesian	Ayrshire	Jersey	Guernsey	Shorthorn	Yearly total
1955	1	–	–	–	–	1
1956	–	–	–	–	–	–
1957	–	–	1	1	–	2
1958	3	5	1	–	–	9
1959	8*	3	6	6	–	23
1960	17*	13	3	2	1	36
Jan.& Feb. 1961	2	2	5	–	–	9
Totals	31	23	16	9	1	80

* Includes one Friesian cross.

All cases, with one exception, were confined to the Friesian, Ayrshire, Jersey and Guernsey breeds. It would appear from Table I that the Channel Island breeds are especially susceptible to this condition. Of the cases under review, over 30 per cent. were in these breeds, although according to the National Milk Records of 1960 for the North West Region, cows and heifers of these breeds accounted for only 12.7 per cent. of the total.

TABLE II
MONTHLY INCIDENCE OF CASES

Jan.	Feb.	Mar.	Apr.	May	June
15	11	5	6	—	—

July	Aug.	Sept.	Oct.	Nov.	Dec.	unknown
1	2	1	8	13	11	7

TABLE III
ONSET OF SYMPTOMS IN RELATION TO PARTURITION

	No.	Percentage (known cases)
0–1 week *post-partum*	47	64·3
1–4 weeks ,, ,, ...	8	11·0
4–8 weeks ,, ,, ...	4	5·5
8–28 weeks ,, ,, ...	6	8·2
Animals pregnant 4–7 months	4	5·5
1 week *pre-partum*	4	5·5
Not known	7	—

Tables II and III classify cases in regard to the month in the year and time after parturition respectively when symptoms first appeared. In preparing data for these tables difficulty was sometimes experienced in ascertaining the exact time of the onset of symptoms, due in main to their mildness or to the existence of some additional disease such as mastitis, metritis, etc., which for a time masked the symptoms of displaced abomasum. In other instances the exact date of parturition was not known. When reasonably accurate approximations to these dates were available they are included in the tables, otherwise they are classified as unknown.

Table II indicates a marked seasonal incidence of the condition, the great majority of cases first showing symptoms between the months of October and April; in fact, only 4 of the 80 cases fell outside this period. There is little doubt that this seasonal incidence is dependent on factors other than climatic ones, such as parturition, high protein feeding, housing and consequent lack of exercise, and others all of which are operative in dairy breeds during a similar period.

The onset of the condition in relation to parturition is shown in Table III. This emphasises the generally accepted association with the early *post-partum* period but equally it indicates that this is not an essential association.

The Clinical Picture

In the majority of cases, symptoms were first noticed within a month of parturition, the predominant features being loss of appetite in varying degree, reduction in milk yield and loss of condition. Appetite was usually selective in that roughage was preferred to concentrates. In almost all cases tests on the milk for ketones were positive. As a result many were misdiagnosed at the outset as acetonaemia. Frequently appetite varied from day to day as described by Begg and Whiteford (1956), but in others it remained at a constant subnormal level. The temperature and pulse were, as a rule, normal.

Faeces varied considerably both in quantity and character. The quantity passed was, of course, related to food intake, while consistency was either normal or fluid.

Rumen movements were invariably reduced in frequency and amplitude and rumination was either completely in abeyance or intermittent and irregular. Rumen sounds were either inaudible or extremely faint.

In some cases the abomasum was displaced to such a degree as to cause swelling of the left paralumbar fossa just posterior to the last rib. This swelling varied in degree not only from case to case but also in the same case from day to day. There was no constant relationship between the presence of this swelling and the severity of the clinical signs.

Indications of abdominal pain were not commonly observed and when present were confined to an occasional uneasy lifting of the hind legs. As a rule the cow's demeanour was bright and alert and thus to a casual observer no obvious signs of ill-health would be apparent.

The course of the disease was generally non-progressive. Following the initial fall in appetite and loss of condition the cows appeared to adjust themselves in some measure to the abnormal position of the abomasum and remained in a chronic state of sub-optimal health with no further deterioration in condition. Sometimes spontaneous recovery appeared to occur in that appetite and milk yield rose to normal levels and abomasal sounds disappeared from the left side of the abdomen. As a rule, however, these cases relapsed at a later date. On a number of occasions, cases positively diagnosed by practising veterinary surgeons have, on arrival at the Field Station, been clinically normal and have remained so for several days before relapsing. It may be that the jolting and abnormal movement associated with the journey in the cattle truck contributed to spontaneous replacement of the abomasum to its correct position.

Whilst the majority of cases exhibited symptoms corresponding more or less to those described, occasional ones showed marked deviations from this pattern by being very much milder, or much more severe. Atypical pictures are illustrated by the following case histories:—

Case 1. Eight-year-old Ayrshire cow. Typical abomasal sounds were first detected by a student practising auscultation of the abomasum in an apparently normal cow on one of the Field Station's associated farms. Questioning of the owner revealed that so far as he knew the cow was normal. Sounds persisted for several days and then disappeared—the condition of the cow remained unchanged. Throughout the subsequent 6 months abomasal sounds were present intermittently for periods of a few days at a time, there being no corresponding changes in the cow's appetite or milk yield. Calving occurred at the end of this period of 6 months and 4 days later the cow developed typical symptoms of displaced abomasum. Diagnosis was confirmed at operation.

Case 2. Six-year-old Jersey cow. Veterinary advice was sought regarding this very high quality cow because of disappointing second and third lactations. In her first lactatoin the yield was 947 gallons, in the second 863, and in the third 837. Displacement of the abomasum was diagnosed but operation was refused until a year later. When admitted to the Field Station she was due to calve in 14 days' time. Her condition was moderate and her appetite and faeces were normal. Typical abomasal sounds were heard high up in the left

flank. Operation was delayed until after calving. Following parturition her apparently normal condition was maintained though abomasal sounds were still audible on the left side. At operation 5 days *post-partum* the diagnosis was confirmed. In her subsequent lactation she yielded over 1,000 gallons.

The above mild cases are in marked contrast to the very severe symptoms exhibited in the following ones:—

Case 3. Six-year-old Jersey cow which at the time of admission to hospital had calved 7 weeks and was giving no milk. There was a history of repeated bouts of inappetence over the previous 5 months but the cause of this was unknown. The cow was extremely dull, emaciated and weak. Appetite was very poor and faeces were scanty and liquid. Typical abomasal sounds were audible in the left flank. Operation was performed in the standing position but the cow was so weak that she had to be supported throughout the interference. Subsequently there was a dramatic improvement in her appetite and she made a rapid recovery.

Case 4. Four-year-old Friesian cow. This cow had been ill since calving 1 month previously. When admitted she was very dull, her eyes were sunken and she would eat nothing. She was giving no milk. Faeces were scanty, orange coloured, foul-smelling and mucoid in character. The left flank was distended to a degree resembling a moderate case of ruminal tympany. Severe pain was evinced by groaning and grinding of the teeth. Depression of the back provoked a loud painful grunt. At operation the displaced abomasum was found to be grossly distended with gas, occupying the whole of the left flank and extending posteriorly to the pelvic inlet. It completely concealed the rumen which was about one-third its normal size. The abdominal cavity contained a large volume of serous fluid. The cow made a rapid recovery, and when discharged 10 days later was giving 4½ gallons of milk daily.

Although these are exceptional cases, they do emphasise the fact that a very mild or very severe clinical picture does not, of necessity, preclude a diagnosis of displacement of the abomasum.

Diagnosis

It is the opinion of the writers that diagnosis of displaced abomasum presents little difficulty in the majority of cases. As a rule a history of recent parturition, together with symptoms described previously are sufficient to indicate the likelihood of the abomasum being displaced. It must be borne in mind, however, that when the case is a mild one, the owner may delay in seeking veterinary advice for several weeks by which time the association of the condition with the immediate *post-partum* period will be obscured.

A positive diagnosis can only be made by the actual demonstration of the presence of the abomasum on the left side of the abdomen. This can be done by peritineoscopy (Steere & Nealy, 1958), or by the aspiration of the abomasal fluid (Butterfield, 1959) or by auscultation, but the writers have not found it necessary to adopt either of the first 2 methods as they have found auscultation to be a simple and reliable method of diagnosis.

The best site for auscultation is over the last 3 ribs about half-way down the cow's left side, but sounds can usually be heard over a wide area of the left abdominal wall.

Three procedures may be adopted.

(1) *Auscultation alone.* Spontaneous sounds typical of displacement of the abomasum are heard. These sounds are of a gurgling or splashing nature, tending to begin abruptly and die away slowly, alternating with or accompanied by a sharp note, or series of notes resembling the sound of a high-pitched gong. The essential characteristic of these sounds is their marked resonant or ringing quality. In the absence of such resonance the writers do not consider that a diagnosis of displacement of the abomasum can be made. While the presence of abomasal sounds is an excellent diagnostic sign, in many cases they are weak or infrequent. In such, prolonged auscultation may be necessary before a diagnosis can be made.

A feature of positive cases is that rumen sounds are either very faint or, in occasional cases, completely inaudible. The detection of loud rumen sounds in this area is thus a strong indication that the abomasum is not displaced.

(2) *Auscultation and ballottement.* Auscultation is carried out as before and at the same time the lower left flank is vigorously balloted in an upwards and inwards direction as described by Wood (1957). The procedure produces loud ringing and splashing sounds in positive cases provided ballottement has been sufficiently vigorous. This method has the advantage that in the majority of cases an immediate diagnosis can be made.

(3) *Auscultation and percussion.* Auscultation over the last 3 ribs is carried out as before whilst the last rib is sharply percussed. In positive cases this produces a hollow resonant sound. This sound is heard only when the head of the stethoscope lies directly over the displaced organ. Thus by moving the stethoscope from point to point, noting the presence or absence of resonance, the approximate size and position of the abomasum can be mapped out.

In the majority of cases, spontaneous abomasal sounds, resonance on percussion and sounds on ballottement are heard quite clearly. In these a positive diagnosis can be made. Less frequently, one or other of these sounds is absent in which case diagnosis may for a time be less certain. However, the writers have found that in positive cases the "missing" sound invariably appears at a subsequent examination, probably as a result of some change in the position or degree of distension of the abomasum. Thus the temporary absence of one or other of these sounds by no means precludes the possibility of the abomasum being displaced.

While resonant sounds of this type are usually associated with displacement of the abomasum this is not invariably the case. Confusion may arise in certain forms of rumen dysfunction in which the rumen contents are of fluid consistency surmounted

by a layer of gas, as occurs in some cases of actinobacillosis of the reticulum, and in cases of so-called "vagus indigestion." In these percussion and/or ballottement of the left abdominal wall results in resonant sounds not unlike those due to a displaced abomasum being heard, but spontaneous sounds simulating those of a displaced abomasum are not heard in such cases. These sounds, simulating those of displaced abomasum, have on 3 occasions led the writers to make an erroneous diagnosis.

The blood picture is of little or no value in diagnosis. In the majority of the cases under review the total leucocyte count was at the lower end of the normal range and the percentage of neutrophils tended to be rather smaller and the percentage of lymphocytes correspondingly greater than usual. This, however, was not sufficiently marked or constant to be of diagnostic significance.

Treatment

Seventy-eight of the 80 cases under review underwent radical surgery. Of the other 2, one made a spontaneous recovery and the other was sent for slaughter at the request of the owner.

Before admission to the Field Station, many of the cases had already been treated by starvation (Begg, 1950) or by rolling (Begg & Whiteford, 1956), but such treatment failed. The present writers have had little personal experience of these conservative methods of treatment and are thus not qualified to discuss their efficacy.

To be effective, radical surgery involves laparotomy, repositioning of the abomasum and fixation of the abomasum to prevent recurrence of displacement. Several procedures have been described (Moore *et al.*, 1955; Begg & Whiteford, 1956; Jennings, 1957; Wood, 1957; Steere & Nealy, 1958; Straiton & McIntee, 1959). These involve an approach *via* the left or right flank, both flanks, or paramedian incision. The experience of the writers has been that they differ greatly both in their facility and their effectiveness.

(a) *Left Flank Approach* (3 cases)

Operation was performed with the cow in the standing position under paravertebral anaesthesia. Entry to the abdomen was made through a vertical left flank incision. Replacement of the abomasum was effected by applying downward manual pressure on the organ while simultaneously traction was applied to it from the right side by passing the hand over the top of the rumen towards the right ventral region of the abdominal cavity. The pylorus was located by touch and gentle traction was applied to the greater omentum near the pylorus. For this to be accomplished effectively it was found necessary for 2 operators to collaborate in replacing the organ, each with an arm through the single incision—an obviously clumsy procedure.

The method has the advantage that good access is obtained to the abomasum. Adhesions between abomasum and abdominal wall can be detected when they exist and if it is thought advisable, broken down. The degree of distension of the abomasum can be assessed and if necessary, easily relieved by needle puncture.

Nevertheless, the method was abandoned for two reasons: (1) considerable difficulty was experienced in locating the pyloric area on the right side of the abdomen, and (2) no satisfactory method of anchoring the abomasum was devised. In this connexion the method described by Jennings (1957) was not attempted.

Results. In all 3 cases displacement recurred. Two were subsequently destroyed, 1 of which at *post-mortem* examination was found to have a large peptic ulcer of the abomasum, and in the other there was an area of peritonitis in the region of the incision, involving the displaced abomasum. In the third case, a second operation using a right-hand approach was successfully performed. (One other case was operated upon, using the left-flank approach, by a veterinary surgeon in practice, who found adhesions between the abomasum and the left abdominal wall. These were broken down and the organ replaced. The cow was admitted to the Field Station in a moribund condition. At *post-mortem* examination it was found that a large peptic ulcer in the abomasum had perforated resulting in a generalised peritonitis.)

(b) *Right Flank Approach* (4 cases)

Using this approach, replacement of the abomasum was effected by passing the hand downwards and forwards towards the rumeno-reticular groove, locating the displaced organ and gently applying traction until it was brought to its correct position on the right ventral aspect of the rumen. The abomasum was anchored by locating the pylorus, bringing it to the abdominal wound and incorporating the greater omentum in the vicinity of the pylorus in the deep layer of sutures when closing the abdomen.

This method was found to have the following disadvantages:—

(1) It was difficult to identify the abomasum by touch when it was at arm's length away. Consequently there was a tendency to apply traction to anything that felt like abomasum such as omentum or even reticulum.

(2) It might be impossible to replace the abomasum without tearing it, or its omental attachments, especially if the organ were severely distended. (This occurred in one instance.)

(3) Severe distension of the abomasum, or adhesions between it and the left abdominal wall could not be detected using a right-flank approach alone.

(4) Identification of the pylorus was difficult, especially in cases in which localised areas of fat necrosis were present in the greater omentum.

(5) Having apparently effected replacement, the operator was never quite certain that the organ had been brought completely to the right side of the rumen.

An advantage of this approach is that anchorage of the abomasum is as a rule simple and effective provided that the pylorus can be located, but this by no means outweighs the disadvantages listed

above. The method has therefore been abandoned except in those cases in which spontaneous recovery has occurred, and operation is performed merely to anchor the organ to prevent future displacement.

Results. In 2 cases the abomasum was found to be displaced at operation. In both these considerable difficulty was experienced in replacing the organ. Nevertheless, post-operative recovery was rapid and uneventful. In the other two spontaneous recovery had occurred and operation was performed merely to anchor the abomasum.

(c) *Bilateral Flank Approach*

The procedure adopted closely followed that described by Wood (1957), repositioning of the abomasum being effected by downward pressure on the organ *via* the left flank incision while simultaneously traction was applied *via* the incision in the right flank. The abomasum was anchored to the right flank as previously described.

In applying downwards pressure on the abomasum the operator on the left should use his right hand and forearm rather than his hand alone. Not only does this simplify the procedure, but also reduces the risk of inadvertent puncture of the organ by the fingers.

One of the difficulties of the operator on the right side is identification of the abomasum so that traction may be applied to it. This difficulty may be largely overcome by his feeling for the hand of the operator on the left side, who then, as it were, hands a portion of the abomasum to him. Gentle traction is applied while the operator on the left side depresses another portion of the abomasum. As a rule the abomasum passes suddenly from left to right, the movement being accompanied by a loud gurgle as gas in the organ passes under the rumen. The operator on the left now ensures that no small pouch of abomasum remains trapped on the left-hand side. The best indication that the abomasum has been completely replaced is that the greater omentum on the left side is closely applied to the ventral sac of the rumen, and is not "bunched up" near the floor of the abdomen. In a few instances, it was noted that the ventral sac of the rumen did not make contact with the floor of the abdomen. This was particularly so in 2 cases in which there was a gap of approximately 8 inches and 6 inches respectively. In such instances it was found that while it was fairly easy to replace the abomasum, the moment traction from the right side was relaxed displacement recurred.

This procedure has on the whole proved simple and effective and has been adopted as the routine method.

Results. Of 66 cases so treated, recovery was rapid and uninterrupted in 57 (86 per cent.). The cows were as a rule clinically normal within 2 or 3 days of operation and discharged from hospital after a week. In 5 cases recovery though complete was somewhat slower but there were no serious complications.

Of the remaining 4 cases, 1 died suddenly about 6 weeks after the operation having until then made a rapid and apparently complete recovery, death being due to rupture into the peritoneal cavity of an abscess which had developed at the site of the right-hand incision. A second case developed wound infection which responded to treatment. In the remaining 2 cases displacement recurred. In 1 of these breakdown of the anchoring sutures occurred within 24 hours of the operation. A second operation was followed by an uninterrupted recovery. In the other case displacement recurred 1 month after operation. Replacement was successfully performed using a paramedian incision. It was noted at operation that the displacement had recurred despite the fact the omentum was still anchored to the incision on the right-hand side.

(d) *Paramedian Incision* (7 cases)

Operation using a right paramedian incision was described by Steere and Nealy (1958) and Straiton (1959). There is little doubt that theoretically this is the operation of choice but the writers have not found it to be the most practical. Through the single paramedian incision the abomasum, even if severely distended by gas, can very easily be replaced since with the cow in dorsal recumbency the weight of the rumen does not impede passage of the abomasum from left to right. Fixation of the abomasum by incorporating the greater omentum near its abomasal attachment in the deep layer of muscle sutures is also easily accomplished. The fact that only one incision is necessary is another obvious advantage compared with the bilateral flank method.

Probably the most serious disadvantage of the method so far as the general practitioner is concerned is the necessity to cast the cow and induce general anaesthesia. Another disadvantage is that due to its ventral position the wound is liable to post-operative contamination and should wound breakdown occur the results are likely to be extremely serious.

Results. Of the 7 cases operated upon by this method, 6 made a rapid and uninterrupted recovery. In the seventh, displacement recurred on the third day after the operation. At re-operation, using the bilateral flank approach, it was found that despite redisplacement, the anchoring sutures were still intact, the abomasum having apparently swung posteriorly around the point of anchorage. Before repositioning could be effected it was necessary to tear the omentum away from these sutures. Despite this recovery was rapid and complete.

Discussion

There can be little doubt that the rapid increase in the incidence of this condition in recent years is more apparent than real. If this is the case it is reasonable to enquire why it went unrecognised for so long. There appear to be 3 reasons. In the first place the symptoms associated with displacement of the abomasum bear a striking resemblance to those of ketosis and in addition, there is, as a rule, a history of recent parturition in both conditions. Thus it is probable that the majority of cases were mistakenly diagnosed as ketosis. Secondly, at routine *post-mortem* examination it is unlikely that displace-

ment of the abomasum will be detected unless especially looked for, because as a result of the abdominal wall being opened and its restricting influence on the viscera being removed, the abomasum would tend to fall back into roughly its normal position. Lastly, the fact that significant lesions are as a rule absent makes *post-mortem* diagnosis even less likely. Nevertheless it is strange that the condition was not fortuitously discovered during exploratory laparotomy until as recently as 1950.

In spite of the above, experience indicates the possibility that there has been an actual rise in the incidence of the condition in recent years. That this may be so is indicated by the following facts. Each year a large number of undiagnosed cases of inappetence in the cow are referred to the Field Station for diagnosis and treatment. A high proportion of these undergo laparotomy either for a specific purpose, or as a diagnostic procedure. Until 1955, no cases of displacement of the abomasum were recognised at operation. Since then an increasing number of such undiagnosed cases have proved to be cases of displacement. Furthermore, up to the middle of 1958, no cases of displacement of the abomasum had been seen on any of the farms associated with the Field Station (adult cow population about 600). Since then 5 cases have been seen.

From the clinical point of view it is remarkable that despite the gross anatomical abnormality which this condition represents, the symptoms exhibited in the typical cases were of such a mild nature. This is no doubt a reflection on the fact that in such cases visible pathological changes were, as far as could be judged at operation, virtually absent apart from the occasional slight excess of peritoneal fluid.

On the other hand, in cases in which symptoms were severe there was invariably a large volume of peritoneal fluid frequently containing many large fibrin clots. In such cases the vessels of the abomasal wall were as a rule very congested. However, no evidence of peritonitis was seen apart from the 3 cases in which the abomasum was adherent to the left abdominal wall. In 2 of these the cause of the adhesion was a perforated peptic ulcer; in the third the cause was not elucidated. The only other pathological change observed at operation was that in a few cases partial rupture of the lesser omentum had occurred.

The aetiology of the condition is a matter of considerable interest. Previous writers have stressed the association of displacement of the abomasum with pregnancy and parturition. The finding of Lagerlof (1929) that in late pregnancy there is a tendency for the abomasum to migrate to the left would appear to be of special significance. Begg and Whiteford quoting Lagerlof's findings suggest that during pregnancy the uterine bulk prevents the rumen exerting its full weight on the displaced abomasum, but that following parturition, the visceral re-arrangement consequent on contraction of the uterus results in the abomasum becoming incarcerated in its abnormal position. Moore *et al.* (1955) consider that the pregnant uterus elevates the rumen and, in addition, tends to push the abomasum forwards, thus causing a tendency for the greater curvature of the abomasum to slip under the rumen. Wood (1959), whilst being in general agreement with Begg and Whiteford refers to cases unassociated with parturition.

The present writers acknowledge that the alteration in the position of the abomasum which occurs in late pregnancy as described by Lagerlof is probably an important factor in many cases, but are reluctant to accept the view that the anatomical changes which follow parturition are of significance. The rumen is a large and heavy organ and consequently it is unlikely that it can be moved upwards or laterally by the pregnant uterus to such an extent that it can, on returning to its normal position at parturition, trap a significant pouch of the abomasum. Even if this were to take place, it must be remembered that the abomasum is a powerfully contractile organ, and if a portion of it were trapped beneath the rumen it would be surprising if this were not rapidly corrected as a result of its contractions.

Moreover, if parturition itself is of primary aetiological importance then these cases unassociated with parturition pose something of a problem, and occasional cases reported in the calf (Wood, 1957), and the adult male (Macleod, 1960; Stabler, 1960) cannot possibly be ascribed to a parturition factor.

The writers are of the opinion that for the clinical condition of displaced abomasum to become established the abomasum must be atonic. Once the atonic abomasum becomes displaced to the left, by whatever the route, there will be no tendency to spontaneous correction. Furthermore, as a result of the atony of the organ, gas will accumulate in its lumen causing distension and consequent further displacement up the left flank.

What then are the factors which may lead to atony of the abomasum? Little knowledge is available concerning factors affecting abomasal tone and the suggested possible causes which follow must be of a speculative nature.

(1) *Diet.* A feature of the husbandry of the dairy cow is the high concentrate ration which is fed immediately before, and for the first few months after, calving, *i.e.* the period of highest incidence of displacement. In man, it is well known that the products of protein digestion in the intestine inhibit gastric tone and peristalsis and Singleton (1951) has shown that in the goat, the duodenal instillation of fat and protein-digestion products depresses or inhibits abomasal motility. Fat, in particular, exerts a prolonged inhibitory effect. It is not unreasonable to assume that the effect in the cow is similar. It may be significant that in recent years there has been a tendency on the part of the manufacturers to increase the percentage of fat incorporated in cattle cake. When the enormous quantity of concentrate food fed to cattle is considered, it appears quite probable that there may be a very considerable reduction in abomasal tone as a consequence. Fincher (1955) has suggested that the prolonged administration of high-grain low-roughage diet predisposes to the condition. It is interesting to speculate as to whether the apparent non-

susceptibility of the beef breeds is related to the fundamentally different diet which they receive during the immediate *pre-partum* and *post-partum* periods.

(2) *Post-parturient disease.* The parturient cow is extremely susceptible to such conditions as hypocalcaemia, ketosis, metritis, mastitis, etc. Should these conditions adversely affect abomasal tone, then they may explain in part the high incidence of displacement of the abomasum during the first month *post partum.*

(3) *Abomasal ulceration.* Two of the cases under review were associated with peptic ulceration of the abomasum, and similar cases have been reported by Marr and Jarret (1955), Cunningham, Jarret and McIntyre (1959) and Tutt, Richards and Yarrow (1959). The question arises whether the ulcer in these cases was secondary to displacement, or whether ulceration was the primary factor which led to atony and consequent displacement of the abomasum.

(4) *Vagal paralysis.* No doubt injury of the vagal supply to the abomasum would lead to atony of the organ. However, the authors have never had cause to suspect this to be a factor in any of their cases, as following replacement normal function is restored.

It must be emphasised that atony is not considered to be the primary cause of displacement, but to be an essential prerequisite. Before the clinical condition can become manifest the abomasum must obviously move, or be moved in part at least to the left-hand side of the rumen. Once this is established then gaseous distension of the organ will lead to complete displacement.

Under what stimulus and by what route does this incipent displacement occur? One obvious route is *via* the groove formed between the posterior wall of the reticulum and the anterior wall of the ventral sac of the rumen and it is probably by this route that the movement of the abomasum in the pregnant cow described by Lagerlof takes place. It is likely that this is the commonest manner in which displacement is effected. Nevertheless it does not explain those cases which occur unassociated with parturition. However, another method by which displacement can occur has been observed. A feature of several cases has been that, at operation, a considerable gap has existed between the ventral wall of the rumen and the abdominal floor. This has facilitated repositioning of the organ, but after bringing it to its correct position, it immediately tended to redisplace through this gap. It is therefore suggested that should such a gap develop associated with an atonic abomasum, then the clinical condition of displaced abomasum may result. It may be argued that the gap observed at operation was probably caused by a reduced food intake and consequent reduction in size of the rumen, as a result of the abomasum being displaced. However, it could equally be that inappetence due to some other factor caused not only the reduction in size of the rumen but also the atony of the abomasum necessary for complete displacement. Another factor which may possibly contribute to the reduction in the size of the rumen is the high concentrate low roughage diet which is fed to the lactating dairy cow.

An interesting case illustrating the importance of this lack of contact between the ventral sac of the rumen and the abdominal floor was a case of displacement associated with extensive left ventral nernia. It was found at operation that as a result of the falling away of the abdominal floor, there was a gap of some 5 inches between it and the ventral sac of the rumen.

There are no doubt other factors which may be involved in the aetiology of the condition. Jennings (1957) has pointed out that shortness of the greater omentum connecting the left longitudinal groove of the rumen to the greater curvature of the abomasum can hinder repositioning at operation. It may well be that this factor may actually predispose certain animals to the condition. Other anatomical factors such as the length of the lesser omentum and the pendulousness of the abdominal wall may also be concerned. Finally, the high incidence of cases in the Channel Island breeds indicates the possibility of hereditary factors being implicated.

It is clear that much remains to be learned about displacement of the abomasum. It is hoped that further research into all the aspects of this interesting condition will advance our knowledge of it from the realm of speculation to one of fact.

Acknowledgments.—The writers wish to thank Professor J. G. Wright for his encouragement and advice, Mr. N. R. Ingman, B.V.SC., M.R.C.V.S., who was actively associated with several of these cases, and Mr. A. G. Singleton, B.V.SC., M.R.C.V.S., for his helpful suggestions and constructive criticism during the preparation of this paper.

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The Activity of Amicarbalide Against *Babesia bigemina*

BY

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SUMMARY. — Amicarbalide (3 : 3¹-diamidinocarbanilide) administered at the rate of 10 mg. per kg. has been shown to have superior babesicidal properties against Babesia bigemina *than phenamidine isethionate B.Vet.C.*

Local tolerance by deep intramuscular injection is good and systemic tolerance is also good.

Severe local reactions resulted when 50 per cent. w/v solution was given by subcutaneous injection and this route of administration is contra-indicated in Southern Rhodesia.

ASHLEY, Berg and Lucas (1960) and Beveridge, Willis Thwaite and Shepherd (1960) have reported on the activity of amicarbalide (3 : 3¹-diamidinocarbanilide) against *Babesia divergens*. Ashley *et al.* (1960) found that amicarbalide was markedly less toxic than quinuronium sulphate B.Vet.C. and Beveridge *et al.* (1960) reported that the local and systemic tolerance of amicarbalide when used at the rate of 5, 10 and 20 mg. per kg. bodyweight was good, and that it was effective in treating cases of *Babesia divergens* infection in the field.

In order to assess the activity of amicarbalide against *Babesia bigemina* it was considered that the most satisfactory method would be to compare it with a known babesicide. Phenamidine isethionate was selected for this purpose as it has been used extensively by us to control reactions to *Babesia bigemina* infections when artificially premunising cattle. These experiments were conducted under conditions of housing, feeding and management identical to those used for premunisation of cattle.

The investigation into the activity of amicarbalide against *B. bigemina* was undertaken in two parts. Firstly, a variable group of cattle were employed to give an indication of toxicity and therapeutic activity of the drug at various levels, and, secondly, a more precise examination was made by comparison with phenamidine isethionate.

Materials

1. Amicarbalide as a 50 per cent. w/v solution (500 mg. in each c.c.).

2. Phenamidine isethionate B.Vet.C. as a 40 per cent. solution.

3. *Babesia bigemina* strain. The strain of *B. bigemina* used in the second part of the work is the strain maintained at the Veterinary Research Laboratory by serial passage every 2 to 3 months in cattle premunised with *Anaplasma centrale*. The behaviour of this strain is therefore well known to us.

4. Cattle. Experiment I. Four splenectomised adult Friesland cattle of various ages were used. Following splenectomy they either relapsed to *B. bigemina* or were infected from those which had relapsed.

Experiment II. Three Friesland and 2 Hereford steers were employed. These animals were splenectomised 28 days prior to infection. One animal, No. 281, relapsed to *Eperythrozoon wenyoni* infection. These animals had been reared under tick-free conditions, and were taken from a group from which are drawn the animals used as donors for *B. bigemina* and/or *Anaplasma centrale* infected blood.

No. 276, Friesland, age at time of splenectomy, 11 months.

No. 280, Hereford, age at time of splenectomy, 12½ months.

No. 281, Hereford, age at time of splenectomy, 12 months.

No. 282, Friesland, age at time of splenectomy, 11 months.

No. 287, Friesland, age at time of splenectomy, 10 months.

Methods

Rectal temperatures were recorded twice daily following splenectomy and blood smears were prepared when a rise in temperature occurred.

The blood smears were prepared from peripheral ear blood and stained with May Grunwald and Giemsa stains.

Haemoglobin determinations were made by the method of Clegg and King (1942).

Plasma bilirubin determinations were made by the method of Malloy and Evelyn (1937).

Blood glucose determinations were made by the method of Somogyi (1930).

Serum calcium determinations were made by the method of Clarke and Collip (1925).

Rotheras reagent was used for qualitative examination for ketone bodies.

In Experiment I amicarbalide was given by subcutaneous injection behind the shoulder at the rate of 20, 10, 5 and 5 mg. per kg. bodyweight.

In Experiment II amicarbalide was given by deep intramuscular injection into the gluteal muscles at the rate of 10 mg. per kg. and phenamidine isethionate was given by subcutaneous injection into the side of the neck at the rate of 1.5 ml. per 44.44 kg. live-weight.

The animals used in Experiment II were divided into 3 groups as follows:—

No. 276	untreated control
No. 281 and 287	amicarbalide-treated group
No. 280 and 282	phenamidine-treated group

Experimental Results

Experiment I

Local and systemic reactions to amicarbalide were assessed and an estimate was made of the therapeutic activity of various dosage levels of the drug against *B. bigemina.*

Local reactions. Using a 50 per cent. w/v solution it was found that, given subcutaneously at the rate of 5, 10 and 20 mg. per kg., a severe local reaction developed at the site of injection at all the dosage levels. The drug was highly irritant and produced an acute inflammation (heat, swelling and oedema). The animals licked continuously at the site of injection. The after-effects in the form of adhesions and scar tissue were still evident some 5 months later.

Systemic reactions. No systemic reactions were noted.

Therapeutic activity. (a) *Babesia bigemina.* At the 10 and 20 mg. level the response was prompt but at the 5 mg. level the response was protracted.

(b) *Anaplasma marginale.* An animal which relapsed to infection with *A. marginale* was given a second dose of amicarbalide at the rate of 20 mg. per kg. The course of the disease and numbers of parasites did not appear to be affected and the animal died 2 days later.

(c) *Gonderia mutans.* No effect was observed on the number of the erythrocytic forms of *Gonderia mutans* in another animal treated at the rate of 10 mg. per kg.

As a result of these observations it was decided that the dosage rate for the treatment of *B. bigemina* infection with amicarbalide was about 10 mg. per kg. bodyweight, and that the subcutaneous route of administration was contra-indicated.

Experiment II

Results of the detailed examinations undertaken are given in Tables I, II, III and IV.

Fig. 1 shows the febrile reactions, the incubation period and the time at which treatment was instituted.

It will be noted from these figures and tables that the reaction of all 5 animals to infection with this strain was approximately the same. The control died on October 20th, 1960, 3 days after parasites were first seen.

Animal No. 287 appears to have been treated at an earlier stage or to have been more resistant to infection for although the rate of infection of the erythrocytes was as heavy as in the others, the erythrocyte count and haemoglobin content never fell to the same levels as the other animals.

From Table I it will be noted that a very much earlier effect on the parasites, as judged by the appearance of degenerate forms, was obtained with amicarbalide than with phenamidine. The quantity of haemoglobin in the serum (Table III) supports this, for not only were the sera of the amicarbalide group free of haemoglobin before that of the phenamidine

TABLE I
INFECTION RATE OF ERYTHROCYTES AND STATE OF BABESIA PARASITES

		Control	Amicarbalide group		Phenamidine group	
		276	281	287	280	282
17.10.60	a.m.	Commencing	Rare	Commencing	Rare	Commencing
	p.m.	Rare	Fairly frequent	Rare	Fairly frequent	Fairly frequent
18.10.60	8 a.m.	Frequent	Very frequent	Frequent	Frequent	Very frequent
	9 a.m.		Treated	Treated	Treated	Treated
	12 noon	Very frequent	Very frequent	Numbers decreasing and a few degenerated forms	Very frequent	Numerous
	3 p.m.	Very frequent	Frequent and degenerated forms present	Frequent and degenerated forms present	Very frequent	Numerous
	6 p.m.	Very frequent	Frequent and degenerated forms present	Frequent and degenerated forms present	Very frequent	Numerous
19.10.60	6 a.m.	Numerous	Frequent—mostly degenerated forms	Rare — mostly degenerated forms	Fairly frequent and large number of degenerated forms	Frequent and some degenerated forms
	2 p.m.	Numerous	Rare—all degenerated forms	Very rare—all degenerated forms	Fairly frequent—mostly degenerated forms	Fairly frequent — some degenerated forms
20.10.60	6 a.m.	Numerous	A few degenerated forms	Two degenerated forms seen	Frequent — some degenerated forms	Fairly frequent — some degenerated forms
	2 p.m.	Died	Negative	Negative	Frequent	Fairly frequent
21.10.60	6 a.m.	—	Negative	Two degenerated forms seen	Frequent degenerated forms present	Fairly frequent — degenerated forms present

Commencing = Approximately one infected erythrocyte in 10 microscopic finds.
Rare = Approximately one infected erythrocyte in 3 microscopic finds.
Fairly frequent = Approximately one infected erythrocyte in every microscopic find.
Frequent = Approximately four infected erythrocytes in every microscopic find.
Very frequent = Approximately seven infected erythrocytes in every microscopic find.
Numerous = Approximately ten infected erythrocytes in every microscopic find.

TABLE II
ERYTHROCYTE COUNT, AND HAEMOGLOBIN AND PACKED CELL VOLUME DETERMINATION

Date	Control			Amicarbalide group						Phenamidine group					
	No. 276			No. 281			No. 287			No. 280			No. 282		
	Erythrocytes 10^6 per cmm.	Haemoglobin g. per 100 ml.	Packed cell vol. %	Erythrocytes 10^6 per cmm.	Haemoglobin g. per 100 ml.	Packed cell vol. %	Erythrocytes 10^6 per cmm.	Haemoglobin g. per 100 ml.	Packed cell vol. %	Erythrocytes 10^6 per cmm.	Haemoglobin g. per 100 ml.	Packed cell vol. %	Erythrocytes 10^6 per cmm.	Haemoglobin g. per 100 ml.	Packed cell vol. %
27. 9.60	5·4	9·2	—	5·9	10·6	—	5·8	10·0	—	6·7	9·9	—	5·6	10·5	—
10.10.60	4·8	9·3	34·5	5·4	9·7	34·0	6·5	9·5	38·5	6·4	9·7	38·0	5·2	10·8	41·5
14.10.60	4·5	9·6	36·0	5·4	10·2	35·0	6·1	9·9	39·0	6·5	10·4	36·0	6·0	10·7	40·0
17.10.60	Infection of Erythrocytes Demonstrated in all Animals										1·0			1·0	
17.10.60	5·1	9·0	34·0	6·0	9·5	33·5	7·4	9·9	37·0	6·3	10·3	39·0	6·3	10·9	38·5
18.10.60				Treated			Treated			Treated			Treated		
18.10.60	5·0	10·2	32·0	3·6	8·4	19·0	7·2	9·8	34·0	5·8	9·2	29·0	5·7	10·8	34·5
19.10.60	1·7	4·2	9·0	2·6	4·3	12·0	4·9	7·8	24·5	2·9	4·4	12·0	1·5	4·3	9·0
20.10.60	0·4	2·15	3·0	0·8	3·4	6·0	1·2	7·2	19·0	0·5	3·0	3·5	1·1	3·2	5·5
21.10.60	—Died	—	—	1·0	3·7	11·0	3·5	6·5	21·5	1·3	2·5	7·0	1·5	2·7	8·0

— = Not done.

TABLE III
SERUM HAEMOGLOBIN

	Control	Amicarbalide group		Phenamidine group	
	276	281	287	280	282
14.10.60	0	0	0	0	0
17.10.60	Infection Demonstrated in all Animals				
17.10.60	0	0	0	0	0
18.10.60		Treated	Treated	Treated	Treated
18.10.60	++	++++	+	++++	+++
19.10.60	+++++	+++	++	+++	+++
20.10.60	+++++	+	+	++	+++
21.10.60	Died	0	0	++	+++

+++++ = Print not visible through ½ inch test tube.
++++ = Print just visible through ½ inch test tube.
+++ = Print clearly visible through ½ inch test tube.
++ = Intermediate
+ = Slight but definite pink colour.
0 = No pink colour.

group, but there was also an earlier reduction in quantity. Haemoglobinuria was found to correspond with the appearance of haemoglobin in the serum.

In general behaviour, the animals in the amicarbalide group were obviously less seriously ill than those in the phenamidine group. The former never stopped feeding entirely whereas the latter did not feed for two days.

The erythrocyte counts and haemoglobin levels of the groups did not show any marked difference between the two drugs.

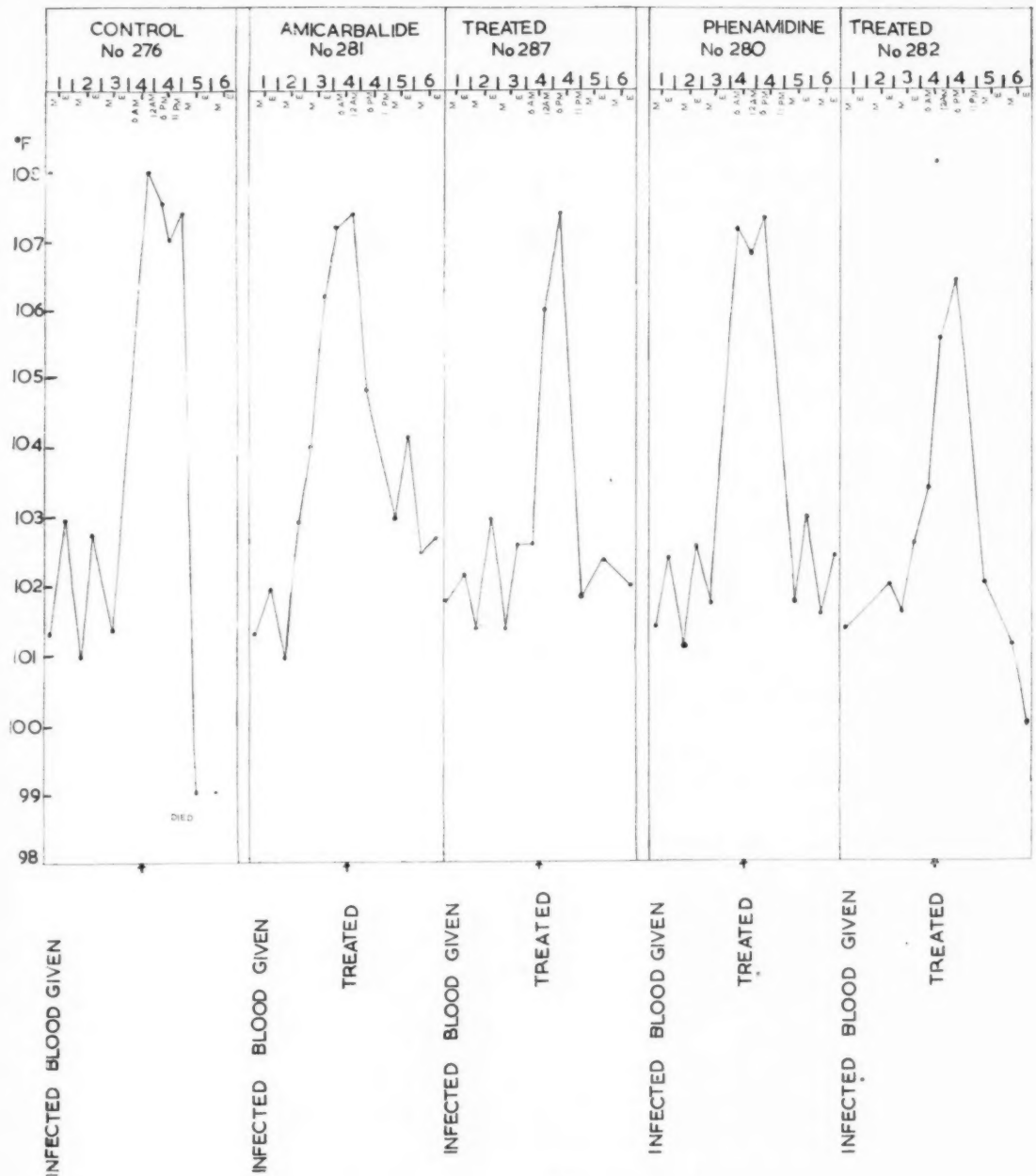
Local reaction to the deep intramuscular injection of amicarbalide was limited to a swelling at the site of injection on the following day.

The two phenamidine-treated animals relapsed on the 9th day after treatment, whereas the amicarbalide-treated animals had not relapsed by the 21st day.

TABLE IV
PLASMA BILIRUBIN, BLOOD GLUCOSE AND SERUM CALCIUM DETERMINATION

Date	Control			Amjcarbalide Treated						Phenamidine Treated					
	No. 276			No. 281			No. 287			No. 280			No. 282		
	Plasma bilirubin mg. per 100 ml.	Blood glucose mg. per 100 ml.	Serum calcium mg. per 100 ml.	Plasma bilirubin mg. per 100 ml.	Blood glucose mg. per 100 ml.	Serum calcium mg. per 100 ml.	Plasma bilirubin mg. per 100 ml.	Blood glucose mg. per 100 ml.	Serum calcium mg. per 100 ml.	Plasma bilirubin mg. per 100 ml.	Blood glucose mg. per 100 ml.	Serum calcium mg. per 100 ml.	Plasma bilirubin mg. per 100 ml.	Blood glucose mg. per 100 ml.	Serum calcium mg. per 100 ml.
27.9.60	0	—	11·4	0	—	10·0	0	—	12·4	0	—	11·1	0	—	—
10.10.60	0·03	—	9·9	0·06	—	9·6	0·06	—	9·4	0·03	—	11·2	0·18	—	—
14.10.60	0·25	34	—	0·03	36	—	0	41	—	0	36	—	0	39	—
17.10.60	Infection of Erythrocytes Demonstrated in all Animals														
17.10.60	0·25	41	—	0·25	39	—	0·5	—	—	0	44	—	0·75	44	—
18.10.60				Treated			Treated			Treated			Treated		
18.10.60	0·05	53	10	0·75	51	10·6	0	58	10·2	0·25	58	10·4	0·13	53	9·0
19.10.60	0·75	44	—	0·13	53	—	0·08	46	—	0·43	56	—	0·75	51	—
20.10.60	0	—	—	1·13	—	—	0·63	—	—	2·63	—	—	1·0	—	—
20.10.60	Died		Died	0·75	75	8·0	0·38	72	9·0	2·12	61	8·0	1·12	61	7·9

— = Not done.



Discussion

A comparison of the activity of amicarbalide with that of phenamidine isethionate has shown that amicarbalide has a distinct advantage over the phenamidine.

This conclusion is based upon the earlier appearance of degenerate forms of the parasite in the amicarbalide-treated animals, as well as the earlier disappearance of parasites from the blood, and haemoglobin from the serum. The general condition of the amicarbalide-treated group remained much better than the phenamidine-treated group; the former animals never ceased feeding and were never as obviously ill as the latter. In addition, both the phenamidine-treated animals relapsed on the 9th day after treatment while the amicarbalide-treated animals had not relapsed by the 21st day after treatment.

No explanation can be offered for the severity of

(*Concluded at the foot of col.* 1, *p.* 740)

An Unusual Case of Thyroid Poisoning in the Dog

BY

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Subject. A 4-month-old Welsh Sheep dog puppy.

History. The owner was a hypothryroid case, and was in the habit of having fairly large quantities of thyroid tablets in the house. The puppy managed to find a box of these, and 2 hours before examination had eaten approximately 80½ gr. thyroid tablets.

Examination. When the writer attended, the animal was in a coma; the pupil showed no reflex to light and was very dilated, and the animal was dyspnoeic. He appeared to be blind and was running in circles, bumping into objects in his path; circling appeared to be in either direction. The pulse rate was in excess of 250. Mucous membranes and sclera were very injected and the respiratory rate was approximately 120 per minute: the temperature was 106.4°.

Heavy sedation was considered of primary importance and, using drugs immediately available, injections of 100 mg. promazine hydrochloride* intramuscularly and 2 ml. 20 per cent. calcium borogluconate intravenously were given. The animal was further examined 1 hour later, and the respiratory rate was now 183 per minute. The heart rate varied between 260 to 300 per minute, and he was salivating profusely.

The animal was anaesthetised with pentobarbitone sodium 3.5 gr. intravenously. The heart rate fell to approximately 180 with a respiratory rate of 40. Two hours later, the heart rate had again risen to 240, but the respiratory rate had fallen to approximately 4 per minute. The animal then appeared to rally, and an intravenous injection of cortisone succinate† was made; to this the animal appeared to be responding, in that the heart rate again fell to 160 and respiratory rate steadied at 40 to 50 per minute. Three hours after injection the animal again worsened. The heart beat increasing in rate and decreasing in strength. Twelve hours after eating the tablets the animal died.

Post-mortem *examination.* On *post-mortem* examination the puppy showed no external abnormalities, but the thyroid glands were congested and markedly enlarged. The suprarenal gland was slightly subnormal in size, but not shrunken. The kidneys were congested and the urinary bladder distended and full. The liver was pale. The stomach was very inflamed; the rest of the viscera appeared normal.

Conclusions. The remarkable feature of the case was the rapidity of the onset of symptoms; similar cases do occur in man, especially following thyroid surgery, *i.e.* thyroid storm; however, no record of a similar case could be found in the veterinary literature, and therefore this case was thought to be worth recording. The dog might have been saved had the cortisone hemisuccinate been administered earlier; alternatively, the writer considered administering apomorphine, but in view of the excited state of the animal and also the time lapse between the ingestion of the substance and the examination, he felt it wiser not to do so. In man, following these cases, there is usually a depleted adrenal cortex. The active agent in the thyroid, thyroxin, combines with the globulin fraction of the blood and this cannot be broken down. The effects of the thyroxin result in death.

Acknowledgments.—I am indebted to Mr. Selwyn Taylor, M.CH., F.R.C.S., of Hammersmith Post-Graduate Medical School, and Dr Mansi, of Mansi Laboratories, Ltd., for the invaluable assistance they rendered in this case.

* Sparine: John Wyeth.

† Efcortilan soluble. (Glaxo.)

The Activity of Amicarbalide Against *Babesia bigemina.—Concluded.*

the local reaction following the subcutaneous administration of amicarbalide as observed by us. the reactions are probably due to purely local factors for other workers (Beveridge *et al.*, 1960) found that the subcutaneous injection of 50 per cent. w/v solution was generally satisfactory, although persistent swellings were encountered in a few instances.

In our experience, one disadvantage of phenamidine isethionate is the interval elapsing between administration and response as judged by the effect upon the parasites and the febrile reaction. Generally we find that up to 18 hours may elapse before an effect is noted, and there is often a strong temptation to give a second dose within that period. In this respect amicarbalide appears to be superior to phenamidine.

Acknowledgments.—The authors wish to thank Mr. J. MacKinnon, Director of Veterinary Services, for permission to publish this article, and Messrs. May and Baker Ltd., Dagenham, Kent, England, for providing the amicarbalide with which these experiments were undertaken.

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Current Literature

ABSTRACTS

Ovine Toxoplasmosis as a Cause of Reproductive Wastage. Preliminary Observations. SMITH, I. D. (1961). *Aust. vet. J.* **37.** 18.

This paper, which is based on field and experimental observations, substantiates existing, and recent reports of ovine toxoplasmosis as a cause of perinatal mortality, and shows also that foetal resorption is an important manifestation of that disease.

The natural disease, due to *Toxoplasma gondii*, was diagnosed in a flock in south-eastern Queensland which had experienced, for a number of years, both a low lambing percentage and a high perinatal mortality—in one year of at least 40 per cent. The foetal membranes of stillborn lambs showed typical pale-yellow necrotic foci on the cotyledons, and Toxoplasma were identified in histological preparations of the afterbirth.

Experimentally, 10 ewes—which were from 101 to 132 days pregnant—were inoculated intraperitoneally with peritoneal exudate from mice which had been infected from a bandicoot. Two 2½-month-old ewe lambs and four new-born lambs were also experimentally infected by the intraperitoneal route.

Infection was followed by a diphasic febrile reaction. Of the 10 pregnant ewes, only 4 gave birth to live lambs; and 2 of these lambs died within 36 hours of birth. One ewe had a stillborn lamb, 2 aborted, and 3 showed a vaginal discharge and suffered foetal resorption. The foetal membranes of 6 out of the 7 ewes, which carried their lambs to term, showed focal necrosis of the cotyledons. Intracytoplasmic toxoplasms were demonstrated in haematoxylin-eosin preparations of the chorion.

In the inoculated lambs there was fever and respiratory embarrassment for nearly a fortnight. No ocular lesions were observed.

Recorded observations of natural outbreaks of ovine toxoplasmosis—in Australia—indicate that the disease is associated with warm localities having an annual rainfall of 25 to 30 inches. Water-rats, bandicoots, and bush-tail 'possums are important reservoirs of Toxoplasma in coastal Queensland.

Cystic Glandular Hyperplasia of the Endometrium in Ewes in New South Wales and Queensland. BARRETT, J. F., MOULE, G. R., BRADEN, A. W. H., & HARRIS, A. N. A. (1961). *Aust. vet. J.* **37.** 14.

A high incidence of cystic glandular hyperplasia of the endometrium of ewes grazed on pastures, dominated by subterranean clover, was first shown to be associated with infertility by Bennetts, Underwood and Shier (1946). Similar manifestations of disease in ewes—on clover-dominated pastures—have since been reported from South Australia, Victoria, and various parts of New South Wales. The present paper describes the same type of genital lesions in sheep from New South Wales, where the pastures were not dominated by clover, and from Queensland, where there was no subterranean clover.

Cysts varied from 1 to 5 mm. diameter, and were commonest in the cervix. The incidence of the cystic condition, as well as the number of cysts, increased with age. That endometrial hyperplasia was not necessarily incompatible with fertility was shown by one group of 19 sheep, in which 9 of 11 pregnant ewes showed cysts (mean number in cervix 2), but that the condition probably predisposed to infertility was shown by the fact that the 8 non-pregnant ewes had a mean number of 7 cervical cysts.

The two important observations of this paper are that endometrial hyperplasia occurs (particularly) in older sheep, in New South Wales and Queensland, and that the source of the oestrogenic substance is not subterranean clover.

G. H. A.

Ovine Mastitis in Mountain Districts in Norway (translated title). SAETER, E. A., & EIELAND, E. (1961). *Nord. Vet.-Med.* **13.** 32.

Observations, over a number of years, in a veterinary practice with about 6,000 ewes, indicate that about 2 per cent. were affected with mastitis each year. 287 milk samples from 262 affected ewes were examined bacteriologically; 86.4 per cent. of the ewes were infected with *M. pyogenes aureus*. Details of other infections are presented in a table in which English headings are used as in other detailed tables on symptoms, treatments and response. There appeared to be two peaks of infection: the first was just after parturition, and was thought to represent a recurrence of a latent infection; the 2nd peak, which occurred at three weeks *post partum*, may have been due to trauma from the lambs' teeth. Moreover, at this time, the ewes were put out to grass, the result of which was a temporary fall in milk yield, and more aggressive suckling on the part of the lambs. Excretion of bacteria continued for considerable periods, and for this reason it is recommended that all infected ewes are slaughtered in the autumn. Early treatment is strongly advised—using sulphanilamide *per os* or sodium sulphadimidine systemically—depending on the severity of the case. Direct injection of penicillin and streptomycin into the udder is also advocated. 10 per cent. of treated sheep died, and the udder was severely damaged in 40 per cent. of the cases.

Experiments with Administration of Nicarbazin to Chickens with Coccidiosis (translated title). OLSSON, N., & BORG, U. (1961). *Nord. Vet.-Med.* **13.** 45.

Two hundred chickens were given nicarbazin in the mash—at the rate of 0.0125 per cent.—from the 5th to the 9th week of age. A similar group was left as untreated controls. It was demonstrated that the drug was an efficient coccidiostatic agent—with no toxic side effects. The treated group made better, and more efficient weight gains than the controls.

H. B.

Hatchery Sanitation as a Control Measure for Aspergillosis in Fowl. WRIGHT, M. L., ANDERSON, G. W., & EPPS, N. A. (1960). *Avian Diseases.* **4.** 369.

The authors showed, experimentally, that *Aspergillus fumigatus* is capable of penetrating both cracked and sound eggs during incubation, giving either embryonic mortality or clinical disease, in the first ten days of life. They suggest that although infection of the litter is commonly blamed as the source of aspergillosis in chicks, the infection in the litter may sometimes have originated from the chicks.

The control measures suggested include fumigation; the avoidance of all mould growth in the hatchery; rejection of any soiled or cracked eggs, and the removal of any that become mouldy, or that are adjacent to mouldy eggs.

Studies on Avian Encephalomyelitis. IV.—Epizootiology. CALNEK, B. W., TAYLOR, PATRICIA J., & SEVOIAN, M. (1960). *Avian Diseases.* **4.** 325.

This important paper on infectious avian encephalomyelitis (I.A.E. or "epidemic tremor") suggests that the virus occurs chiefly as an enteric infection of growing and adult birds. Experimentally, oral infection of laying hens produced a drop in egg production, and in hatchability. During this period (6 to 13 days after inoculation) the eggs were infected, and virus was present in the faeces.

Chicks from these infected eggs developed clinical signs of I.A.E. during the first week of life. Susceptible chicks that had been in contact with them in the incubator or brooder—also developed the clinical disease, but at a later stage, *i.e.* at 11 to 16 days old.

The authors suggest that the possibility of oral vaccination of young growers should be investigated.

Paratyphoid Infections in Turkeys. GRUMBLES, L. C., & FLOWERS, A. I. (1961). *J. Amer. vet. med. Ass.* **138.** 261.

The authors report that seven (5 per cent.) of 136 samples of cottonseed meal and/or soyabean oil meal yielded Salmonellae belonging to six serotypes. As most previous studies have concentrated on foodstuffs of animal origin, the present work serves to indicate that food of vegetable origin must also be considered as a potential source of Salmonella infection.

They state that it will be necessary to ensure that foodstuffs are free from Salmonella contamination before these infections can be controlled in turkeys.

E. A. G.

Biochemical Changes in the Tissues of Animals Injected with Iron, Acid Phosphates, and other Enzymes. GOLDBERG, L., MARTIN, L. E., BATCHELOR, A. (1960). *Biochem. J.* **77.** 252.

Very high doses of iron, either as iron-dextran or saccharated iron oxide, injected into mice, bring about stunting of growth and hyper-plastic enlargement of the liver. There is a disproportionately large and apparently permanent increase in the acid phosphatase activity of the liver. Enhanced activity is seen also in the liver of the rat, and hamster, but not of the guinea-pig. Neither the injection of iron doses, which were less massive—yet well above the clinical level, nor the administration of saline or dextran, had any such result.

In the mouse and rat, the injection site in muscle and subcutaneous tissue have a raised acid-phosphatase activity after administration of heavy doses of iron-dextran, as have the spleen and kidney of the mouse.

In the siderotic liver the activities of various other enzymes were also raised. It is suggested that the observed changes may be partly lysosomal in origin, but that the activity of macrophages, and related cells, may also be involved.

Divisional News

THE WESTERN COUNTIES VETERINARY ASSOCIATION

The 77th annual general meeting was held at the Rougemont Hotel, Exeter, on March 23rd, 1961. The President, Mr. P. G. Steel, occupied the chair. Thirty-eight members and 1 visitor were present. Apologies for absence were received from 14 members.

Minutes

The minutes of the previous meeting, having been published, were approved and signed.

Correspondence

A letter from THE VETERINARY RECORD regarding the supporting of divisional meetings was read and noted.

A letter from the B.V.A. in reply to the W.C.V.A. concerning the Cheshire swine fever vaccination scheme and bulk buying was read and discussed. It was proposed that Mr. Pettit and Mr. Harkness be asked to note and report developments on this bulk-buying group.

A letter from the Ministry of Agriculture on the subject of poultry courses was received with regret. Mr. Fincham stated that no course was under consideration at the moment. The Cornish Clinical Club's point on the subject of courses in Cornwall was stressed, and Mr. Fincham was asked to take note.

The members present were informed of the developments in the certified crystal violet vaccination pig scheme as it applies to Taunton Market. A letter from the B.V.A., with reference to the setting up of new schemes was read.

A report on the Nuffield Farm Project was received and noted.

A letter was read from the Cornish Clinical Club concerning the Special Diagnostic Panel expenses; it was decided that no action be taken with regard to these. A letter explaining this to be sent to the Cornish Clinical Club. After some discussion as to how the Club could best serve its members, it was decided to appoint delegates from the W.C.V.A. to meet representatives of the C.C.C., in order to discuss

how best the wishes of the C.C.C. could be implemented, and to report back at the next meeting. The appointment of delegates of the W.C.V.A. was to be left to the Council.

Messrs. Atkinson, Pettit, Perkiss, and Dall reported on the current B.V.A. business.

Messrs. Alexander, Mather, James, and Dall reported on the A.I. centres. Arising from the A.I. Board representatives' reports: it was proposed by Mr. Pettit and seconded by Mr. Wood: "that a veterinary surgeon should be resident at A.I. Centres at which bulls are kept." This proposition to be forwarded to the B.V.A.

Nominations

Mr. V. C. Irwin was proposed by Mr. Ayliffe and seconded by Mr. Harris.

Messrs. D. P. Attenbrough, A. A. Webster, and D. G. W. Reakes, were proposed by Mr. Shattock and seconded by Mr. Carr.

Election of New Members

Messrs. Blake, Hughes, Renford, and Shaw, were elected unanimously.

Resignations

Miss Parker, and Mr. Boyd, tendered their resignations, because they were leaving the district. Both resignations were accepted with regret. The secretary was asked to write to Miss Parker (a former President of the Association).

Treasurer's Report

The treasurer presented his report, and it was decided to utilise certain moneys to assist the two Clinical Clubs. Mr. James reported, that as a result of the dances held, he had a balance in hand of £44 10s. 10d. It was agreed that 5 gns. be donated to the V.V.B.F., and that Mr. James should open an account with the balance. It was proposed and agreed that a dance be held during the year. The report was adopted.

The secretary's report on the last year's activities was accepted.

Elections of Officers

The following officers were elected for the year 1961/62:—*President*: Mr. Blakey; *Senior Vice-President*: Mr. P. Steel; *Junior Vice-President*: Mr. J. G. Wilson; *Honorary Treasurer*: Mr. G. Atkinson; *Honorary Secretary*: Mr. R. James; Tiverton; *County Secretaries*: *Devon*: Mr. Mackellar; *Cornwall*: Mr. H. James; *Somerset*: Mr. Orfeur; *Honorary Auditors*: Messrs. Beer, Aplin & Co.; *Members of the Council*: Messrs. Leask, Alexander and Holt; *Representatives on the B.V.A. Council*: Messrs. Atkinson, Dall, Pettit and James.

Presidential Address

Mr. P. G. Steel gave his Presidential address, in which he reviewed the work done in the last year with the Cheshire swine fever scheme and the Nuffield Farm Project.

Installation of President

Mr. Blakey was welcomed as the new President. He thanked the retiring President for the work he had done during the past year.

Other Business

PROPOSED ALTERATION TO RULES: It was proposed by Mr. Orfeur and seconded by Mr. James that "former Presidents be ex-officio members of the Council of the W.C.V.A., with no voting power".

Messrs. Carr, Wood, and James wished to thank the Ministry for reporting the presence of foot-and-mouth disease to the practising veterinary surgeons.

Mr. Fincham suggested—that in future all speakers should be heard at 3 p.m., and further business be transacted after their speeches.

Mr. Mackellar reported on the Westward Television by letter.

THE WEST OF SCOTLAND DIVISION

The annual general meeting was held at the University Veterinary Hospital, Bearsden, on Thursday, May 25th, 1961, at 7.30 p.m. The President, Mr. A. S. Chapman, was in the chair. Twenty-five members and 10 visitors were present.

Scientific Paper

A paper on "Aspects of Toxicology" was delivered by Dr. H. Paver and Mr. P. J. Barden, of the Department of Veterinary Hygiene and Preventive Medicine, Royal (Dick) School of Veterinary Studies. The authors told of their experiences in diagnostic toxicology—during recent years—when material had consisted of large and small animals, birds, foodstuffs and other suspect substances. Reference was made to the changing pattern of toxicology and the newer poisons employed in agricultural methods.

The paper stimulated a practical discussion of current problems in general practice and laboratory work arising from poisoning.

The President and others present expressed their appreciation to the co-authors for their contribution.

Business Meeting

Apologies for absence were received from Mr. D. Boyce and Mr. S. Jennings.

Obituary

The President referred to the recent death of Major J. G. McGregor, of Paisley, who was a member of the Division for many years. An officer of the Ministry of Agriculture and Fisheries, Major McGregor was an early and vigorous advocate of tuberculosis eradication in cattle, the influence of which now extended far beyond the bounds of the Division. Sympathy was expressed—on behalf of members—to Mrs. McGregor. Those present stood in token of their respect.

Minutes

The minutes of the annual general meeting held on May 25th, 1960, were read and signed. There were no matters arising from these minutes.

Correspondence

A letter was read from the B.V.A. concerning broken hypodermic needles in flesh food animals. It pointed out that broken hypodermic needles were, from time to time, found in meat and meat products, particularly in relation to pork. The attention of

members was drawn to this type of accident; and they were asked to notify their clients of the need for great care when injecting pigs.

A letter was read from the B.V.A. which drew the attention of the Division to the prize available, annually, as a memorial to Mr. Harry Steele-Bodger.

A letter was read from the B.V.A. which described the structure of the present Council and the method of electing its members. The report of the sub-committee on the election of Council B.V.A. was enclosed. In essence, this suggested a reduction of Council by one-quarter to one-third. Observations on the report were invited. The letter also referred to the annual request for a list of paid-up members of the Division. It was agreed to write expressing support for the sub-committee's report from the Division.

Secretary-Treasurer's Report

The report was approved.

Annual subscription. The case for increasing the annual subscription to £1 was recommended by the secretary-treasurer. Following a proposal by the President it was agreed that an increase should be made.

Presidential Address

Mr. Chapman reviewed activities of the Division for the past year, particularly the preparation of the new constitution and the various meetings held. He referred to his opportunity of attending meetings of the Farm Livestock and Veterinary State Medicine Committees of the B.V.A., and pointed out the probable developments in the eradication of brucellosis and swine fever that were expected in the next few years.

The President then reviewed and recommended the recent booklet on the economics of veterinary practice prepared by the Society of Practising Veterinary Surgeons. He concluded by expressing his thanks to the officers and members for their support during the year 1960-61.

Election of Office Bearers, 1961-62

The composition of Council of the Division—for the ensuing year—was unanimously agreed as follows:—

President: Mrs. M. L. Weipers; Senior Vice-president: A. S. Chapman; Junior Vice-president: I. M. Lauder; Secretary-Treasurer: R. S. F. Campbell; H. Begg, Dr. W. A. Greig (retiring 1962); A. T. Dickie, J. Isbister (retiring 1963); H. Andrew, D. D. Lawson (retiring 1964).

Representatives to Council, B.V.A.: Mrs. M. L. Weipers, Messrs. Campbell and McGrath. It was agreed that Divisional procedure—for the election of representatives to Council—would be reviewed later—in the light of any amendment in the composition of Council. The current representatives were, therefore, elected for one year only.

Election of New Members

The following were elected as members: Dr. A. D. Weaver (Glasgow), Miss M. Orr (Hamilton), Messrs. J. D. Aitken (Paisley), G. L. Barr (Mauchline), I. McMillan (Mauchline), and A. D. Pottie (Paisley).

Other Business

R.C.V.S. and P.D.S.A. joint discussions: Mr. B. Martin expressed disquiet at the possibility of licensees of the welfare society being elected to the Supplementary Veterinary Register. Whilst some sympathy for this view was admitted by other members, it was pointed out that the talks were, as yet, exploratory. After a discussion of the subject, it was agreed to write to the British Veterinary Association expressing interest in the scheme, and the hope that the B.V.A. would consult Divisions on their views before any action was taken.

Fees for the examination of animals for soundness: Mr. J. Love stated his dissatisfaction with the practice, whereby some insurance companies offer a fixed fee for examinations irrespective of the journey involved. The secretary stated that this matter was —at present—receiving the attention of a branch of the B.V.A. The meeting discussed the question of fees for examinations; but no action was taken by the Division.

THE EASTERN COUNTIES VETERINARY SOCIETY

The spring meeting of the E.C.V.S. was held at Bury St. Edmunds, on May 9th, 1961. Forty-six persons were present. During the business meeting it was agreed to withhold the operation of a local Swine Fever Crystal Violet Vaccination Scheme after the B.V.A. had requested local divisions to take no further action. Dr. E. A. Gibson, V.I.O., Norwich, agreed to run a poultry refresher course at Norwich, in October. It was announced that a refresher course on sheep would be held at the Cambridge Veterinary School, and members were asked to express any preferences for subjects to be covered.

A resolution proposing an approach to the R.C.V.S., on the subject of waiving the payment of registration fees by retired members, was referred to the executive committee for discussion.

Talk by Mr. L. Guy Anderson

After the business meeting, Mr. L. Guy Anderson gave an informed and amusing talk on: "Some thoughts on the future of veterinary practice." The discussion was opened by J. J. Low; and many members contributed suggestions and anecdotes.

Two interesting *post-mortem* specimens were produced. The first of sectioned lumbar vertebrae from a paraplegic boar, showing, in addition to ankyloses, the formation of exostoses, which protruded into the spinal canal. The second was of a fractured femur from a sow which had united without much distortion, and without any kind of artificial fixation.

Interesting cases discussed included: death of a mare following torsion of the large bowel with only mild symptoms of colic; death of a sow after torsion of the stomach and splenic detachment; death of two bullocks following stilboestrol therapy, and a possible poliomyelitis type syndrome in marsh-grazed yearling bullocks.

News and Comment

FAO/WHO EXPERT PANEL ON VETERINARY EDUCATION

The FAO/WHO Expert Panel on Veterinary Education, which was established on the recommendation of the International Meeting on Veterinary Education, convened by FAO in London last year, has now begun its work. Members of the Panel include: Sir John Ritchie (United Kingdom); Dr. R. M. C. Gunn (Australia); Dr. El Nazir Dufsalla (Sudan); Dr. L. Sahai (India); Dr. R. Rastegar (Iran); Dr. T. Lloyd Jones (Canada); Dr. T. Ramos Sace (Peru); Professor Dr. S. R. Numans (Netherlands); Professor Dr. C. Bressou (France); Professor Dr. Jac. Jansen (Netherlands); Dr. William A. Hagan (United States). The appointment of 2 additional members to this Panel will be announced at a later date. FAO officials have announced that a programme has been agreed and that members of the Panel will now begin to provide information on veterinary requirements in the different regions and the systems of education now being practised. In addition, views will be expressed on the location of new veterinary schools and on any considerations for education to meet special requirements in various regions.

Special attention will be given by the Panel to ways and means of educating and training, in the technically developed countries, veterinary undergraduates and post-graduates from the underdeveloped and the developing countries.

The objective is not only to provide well-trained veterinary personnel to man and extend the existing veterinary services in these countries, but also to have teaching staff available for the training of veterinary undergraduates when veterinary schools are established. The Panel is also to deal with the place of veterinary auxiliaries in veterinary services and the training they should undergo to fit them for specific duties.

This work is being carried out through correspondence, preparatory to the first meeting of the Panel which is timed to be held at Rome early in 1962.

Certain countries, it is pointed out, are already showing increasing interest in assisting in the veterinary training of personnel from developing countries. For many years some veterinary schools have been receiving a limited number of veterinary undergraduates from such regions, for whose training their Governments have usually borne the expenses. Ways and means are now being discussed to increase the number of trainees and to provide, from other sources, the required financial support. The FAO/WHO Panel will give full consideration to all suggestions, reports and proposals, and will advise on how funds made available by countries, organisations, foundations and trusts can best be used to further the cause of veterinary education, especially in the developing countries.

ROYAL SOCIETY OF HEALTH FELLOWSHIP

The Royal Society of Health has conferred a Fellowship on Mr. G. S. Wiggins, Metropolitan Cattle Market, Islington, Assistant Veterinary Officer to the Corporation of London, in recognition of his work on public health.

V.V.B.F. ARCHIE B. MACINTYRE AND E. F. LEWIS FUNDS

The Secretary gratefully acknowledges contributions to the Fund in memory of the late Archie B. MacIntyre from:—

Baxter, Miss R.
Dawson, A. H.
* Gates, H. S.
* Serth, G. W.
Somer, F. E.
Waugh, R.

* Second contribution.

The Fund now totals £104 10s.

Contributions are also gratefully acknowledged from the following in memory of the late Mr. E. F. Lewis:—

Anon.,
Holmes, J. W. H., & Faull, W. B.,
Royal Veterinary College Students' Union,

amounting to £11 10s.

ROYAL VETERINARY COLLEGE ASSOCIATION ANNUAL DINNER, 1961

Details of the R.V.C.A. Annual Dinner, which is to be held in Oxford on Thursday, September 7th, during the B.V.A. Congress, are published in the Notices section of this issue. Tickets are available from the Dinner Secretary, K. Barnett, Esq., Royal Veterinary College, Camden Town, London, N.W.1, price 25s., and early application is advised.

THE REGISTER OF VETERINARY SURGEONS

The undermentioned gentleman was admitted to Membership of the Royal College of Veterinary Surgeons on July 21st, 1961, in virtue of the registrable degree of B.V.Sc., conferred on him by the University of Liverpool:—

Carding, Anthony Harold, Sandycroft, 89, Spring Gardens, Leek, Staffs.

Under the provisions of Section 17 (2) of the Veterinary Surgeons' Act, 1948, the name of the undermentioned was restored to the Register of Veterinary Surgeons on July 24th, 1961:—

Vincent, John Francis Davis, Pentire, The Croft, Clevedon, Somerset. (Graduated, Glasgow, December 5th, 1951.)

PERSONAL

Marriages

BRACEWELL—PARKER.—On Saturday, July 22nd, 1961, at St. Martin's Church, Epsom, Surrey, Colin Derek Bracewell, B.SC., B.V.SC., M.R.C.V.S., of Comp-

ton, Berkshire, to Susan Margaret Parker, of Ewell, Surrey.

MACINTYRE—FORDE.—On Tuesday, June 20th, 1961, at St. Ninian's Church, Glasgow, Colin David Macintyre, B.V.M.S., M.R.C.V.S., to Maircade Forde of Hollybrook, Claremorris, Co. Mayo.

Births

GEORGE.—On June 26th, 1961, to Janet, wife of Ken George, M.R.C.V.S., at Barnstaple, a daughter, Vicki Marie.

HASTIE.—On July 19th, 1961, to Laura, wife of Hamish Hastie, M.R.C.V.S., of Cross House, Corbridge, Northumberland, a daughter, Mhairi, sister to Calum.

HUGHES.—At Lancaster Royal Infirmary on July 16th, 1961, to Lesley, wife of Ian B. Hughes, B.V.SC., M.R.C.V.S., of 59, Copy Lane, Caton, near Lancaster, a daughter, Sally, sister for Mike and Jill.

LEITCH.—On July 22nd, 1961, to Kathleen, wife of Iain D. C. M. Leitch, B.SC., M.R.C.V.S., 31, High Street, Laurencekirk, a son, Alan Scott Cameron, a brother for Carol.

MASON.—On July 19th, 1961, to Shirley, wife of Roger Mason, B.V.SC., M.R.C.V.S., of Corfe, Taunton, Somerset, a second daughter, Susan Margaret.

WRIGHT.—On June 25th, 1961, to Marguarita, wife of Clifford Wright, B.V.SC., at Kampala, Uganda, a daughter, Elaine Mary.

COMING EVENTS

September

2nd (Sat.). STREATLEY '58 CLUB REUNION. Annual Dinner at "Ye Miller of Mansfield."

3rd to 9th (Sun. to Sat.). 79th Annual Congress and Exhibitions of the British Veterinary Association at Oxford

7th (Thurs.). ROYAL VETERINARY COLLEGE ASSOCIATION. Annual Dinner during the B.V.A. Congress at St. Edmund's Hall, Oxford.

GLASGOW VETERINARY SCHOOL ALUMNUS ASSOCIATION. Dinner at the Mitre Hotel, Oxford, 7 p.m.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the date on which disease has been confirmed, followed by the postal address and local authority.

Anthrax

July 20th, 1961. W. Coles, Southwoods Farm, Culmstock, Cullompton, Devon (Parish: Culmstock). (Cattle.) DEVON.

July 21st, 1961. S. Gibson & Son, Town End Farm, East Boldon, Co. Durham. Disease at: Yellow Leas Farm, East Boldon, Co. Durham (Parish: Boldon). (Cattle.) COUNTY DURHAM.

July 24th, 1961. G. R. Gent & Son, Howe Hill Farm, Stoke Doyle, Peterborough, Northants. Disease at: Barnwell Pumping Station Field, Barnwell, Peterborough, Northants. (Parish: Barnwell). (Cattle.) NORTHAMPTONSHIRE.

July 24th, 1961. R. Duncan & Son, Brick House, Southwick Road, Kirkbean, Dumfries (Parish: Kirkbean). (Cattle.) KIRKCUDBRIGHTSHIRE.

Fowl Pest

July 18th, 1961. J. Jackson, Dill Hall Farm, Church, Accrington, Lancs. LANCASHIRE.

July 19th, 1961. J. A. Kay, Breeze Poultry Farm, 37, Back Lane, Clayton-le-Woods, Lancs. LANCASHIRE.

July 19th, 1961. Le Grys Bros. (Turkeys) Ltd., The Laurels, Ubbeston, Halesworth, Suffolk. EAST SUFFOLK.

July 20th, 1961. J. McKenna, Nightingale Farm, Langham, Colchester, Essex. ESSEX.

July 20th, 1961. K. W. Brown, 285, Crofton Road, Orpington, Kent. KENT.

July 21st, 1961. G. D. Cropper, 6, Hollingale Cottages, Rising Bridge, Accrington, Lancs. LANCASHIRE.

July 21st, 1961. R. Ainscough, 33, Back Lane, Clayton-le-Woods, Chorley, Lancs. LANCASHIRE.

July 21st, 1961. T. Iddon, 21, Back Lane, Clayton-le-Woods, Chorley, Lancs. LANCASHIRE.

July 22nd, 1961. Mrs. E. A. Veal, Red Roofs, Little Thetford, Ely, Cambs. Disease at: Ely Road, Little Thetford, Ely, Cambs. ISLE OF ELY.

July 24th, 1961. A. Waring, Beardswood Cottage, Bury Lane, Withnell, Chorley, Lancashire. Disease at: Archers Farm, Withnell, Chorley, Lancs. LANCASHIRE.

July 24th, 1961. L. Smalley, Knowles Farm, Withnell, Chorley, Lancs. LANCASHIRE.

July 24th, 1961. S. Nichols, New York Farm, Bramham, Boston Spa, Yorks. YORK, WEST RIDING.

Swine Fever

July 18th, 1961. F. Hillman, I.C.I. Farm, 52, Common Road, Stafford. BOROUGH OF STAFFORD.

July 18th, 1961. P. C. Perrett, Roome Farm, Okeford Fitzpaine, Blandford Forum, Dorset. DORSET.

July 18th, 1961. W. H. Bamber, Moreton House Farm, Aighton, Stonyhurst, Blackburn, Lancs. LANCASHIRE.

July 19th, 1961. Mrs. F. M. Taylor, Lower Wych, Malpas, Cheshire. CHESHIRE.

July 19th, 1961. J. Blackhurst, Fazakerley Farm, Simonswood Lane, Northwood, Kirkby, Liverpool, Lancs. LANCASHIRE.

July 19th, 1961. P. G. Williams, Holmes Farm, Spaxton, Bridgwater, Somerset. SOMERSET.

July 19th, 1961. B. V. Blount, 14, Western Park Avenue, Shelton Lock, Derby. Disease at: Canal Side, Shelton Lock, Derby. DERBYSHIRE.

July 19th, 1961. Messrs. Jones & Williams, Oakfields, Radwith Lane, Morton, Oswestry, Salop. SHROPSHIRE.

July 20th, 1961. W. Scott & Son, Hunsdale Farm, South Cave, Brough, Yorks. YORK, EAST RIDING.

July 20th, 1961. P/O Jackson, P.S.I.P. Wyton R.A.F. Station, Huntingdon. Disease at: The Pig Farm, Wyton R.A.F. Station, Huntingdon. HUNTINGDONSHIRE.

July 20th, 1961. G. W. Hammond, Meadow Farm, Thurgarton, Aldborough, Norwich, Norfolk. NOR 40 Y. Disease also at: Chestnut Farm, Thurgarton, Aldborough, Norwich, Norfolk. NORFOLK.

July 20th, 1961. R. Cresswell, Frog Hall Farm, Upton Snodsbury, Worcester. WORCESTERSHIRE.

July 20th, 1961. E. T. Pearce, Turleycoates Farm, Outlane, Huddersfield, Yorks. YORK, WEST RIDING.

July 21st, 1961. A. Moore, Summerley House Farm, Dronfield, Sheffield, Yorks. DERBYSHIRE.

July 21st, 1961. R. Stone, Holme Farm, Temble Hirst, Selby, Yorks YORK, WEST RIDING.

July 21st, 1961. L. E. Evans, 42, Forest Drive, Keston, Kent. Disease at: Little Farleigh Green, Farleigh, Warlingham, Surrey. SURREY.

July 24th, 1961. E. J. Croker, Wayside Bungalow, Butcombe, Bristol. Disease at: The Piggeries, Cholwell Farm, Butcombe, Bristol. SOMERSET.

July 24th, 1961. P. E. E. Prideaux-Brune, Plumber Manor, Sturminster Newton, Dorset. Disease at: Peach Buildings, Plumber Farm, Sturminster Newton, Dorset. DORSET.

July 24th, 1961. R. P. Steventon, Blakemore House, Oulton, Norbury, Stafford. Disease at: Old Rectory Farm, Norbury, Stafford. STAFFORDSHIRE.

IN PARLIAMENT

Cancer Research

DR. STROSS (July 20th) asked the Parliamentary Secretary for Science whether any official research is being carried out on the relationship between nutrition and behaviour and the factors that determine food habits; and whether he will enlarge on that part of the statement in the 1960 annual report of the officially supported Chester Beatty Research Institute which speaks of protection against carcinogenesis by nutritional means.

MR. DENZIL FREETH: No Government-supported research is at present being undertaken on the relationship between nutrition and behaviour, but data on food consumption and expenditure by different groups of the population is recorded in the National Food Survey, and changes in food habits can be deduced from this.

Work at the Chester Beatty Research Institute has shown that the incidence of certain types of cancer in mice can be reduced by restricting the number of calories in the diet and that the experimental induction of cancer of the liver in rats can to a certain extent be prevented by supplementing the diet with protein and the vitamin riboflavin. As a result of these leads, experiments are now in progress to determine the degree of protection afforded by a wide variety of dietary modifications against cancer-producing agents.

DR. STROSS asked the Parliamentary Secretary for Science what Government or officially supported research is at present being conducted on cell division and its inhibition with special reference to inhibiting the growth of cancer formations; and where it is carried out.

MR. DENZIL FREETH: Studies of cell division in plant, animal and human material, and of the inhibiting effects of many types of chemical agent form an important part of the work of the Chester Beatty Research Institute, which receives considerable financial support from the Medical Research Council. These studies have led to the development of a number of drugs with useful, if limited, application in the treatment of special types of cancer. Work on cell division is also being undertaken in many university departments of zoology, particularly in London and Edinburgh.

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

SCIENTIFIC

Heinz-Ehrlich Bodies Associated with Kale Feeding

Sir,—Heinz-Ehrlich bodies have been observed in erythrocytes following the administration of a number of drugs particularly aromatic nitrogen compounds of the nitro-benzene series and those related to aniline, sodium nitrate, sodium chlorate, and naphthalene. According to Wintrobe (1956) "although Heinz bodies may be found in the absence of anaemia, large doses of the drugs producing them will cause haemolytic anaemia." These bodies have also been observed in extravasated blood and they develop in normal cells on storage. Smith *et al.* (1958) considered their production to be a normal process in the breakdown of the red blood corpuscle.

On December 17th, 1960, a case of suspected kale poisoning was reported in an 18-month-old Shorthorn heifer belonging to the Field Station herd. Heavy kale feeding had been in progress for six weeks and this animal was not thriving. The usual symptoms of inappetence, increased respiratory rate, haemoglobinuria and a rise in temperature to 106.8° F. were present. The blood picture was as follows:—

Band forms	6 per cent.
Polymorphs	30.5 per cent.
Lymphocytes	54.5 per cent.
Monocytes	7 per cent.
Eosinophils	1.5 per cent.
Basophils	0.5 per cent.
WBC's	20.600/cu. mm.
RBC's	1.8 million/cu. mm.
Haemoglobin	4.9 Gm. per cent.
PCV	11.75 per cent.
Reticulocytes	1.93 per cent.

Reticulocytes were counted in supravitally stained smears (uncounterstained) and 55 per cent. of red cells were found to contain Heinz bodies. The number of these bodies decreased following the withdrawal of kale and this animal made a natural recovery.

In a feeding experiment conducted by one of the authors (J. E. D.) and commenced on 24.1.61 four Friesian heifers were fed 50 lb. of kale daily and four were used as controls. The kale-fed animals failed to thrive as well as the controls and after four weeks of feeding, one animal (No. 98K) was particularly reluctant to finish her kale. On 21.2.61 this animal showed complete loss of appetite for kale but ate hay readily. Frothing at the mouth was observed, the respiratory rate was 40 per minute and the temperature 105.0° F. Fluid sounds were heard on auscultation of the chest similar to those of pulmonary oedema. A blood sample showed a normal total and differential white cell count which suggested that there was no pyogenic or viral lung infection. The red cell count was normal. In supravitally stained preparations, however, numerous Heinz bodies were seen and the possibility of kale poisoning was considered despite the absence of bile pigments and haemoglobin in the urine. On the strength of these findings kale was temporarily withdrawn and hay increased.

Blood samples were collected from the other 7 heifers and Heinz bodies were only found in the red cells of members of the kale group and the percentage present is shown in the table. Kale was withdrawn on 20.4.61 and the animals were turned out to grass on 26.4.61. A gradual reduction in the number of Heinz bodies was observed.

PER CENT. HEINZ BODIES IN ERYTHROCYTES

No.	27.2.61	6.3.61	28.3.61	25.4.61	3.5.61	10.5.61	16.5.61
98K*	3.75	1.1	10.0	6.0	1.1	0.9	0.0
99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
101	0.0	0.0	0.0	0.0	0.0	0.0	0.0
103K	5.3	23.0	27.0	4.0	0.3	0.3	0.0
104	0.0	0.0	0.0	0.0	0.0	0.0	0.0
109K	7.1	25.0	10.5	6.2	0.75	0.7	0.0
110K	14.4	26.0	15.5	4.2	3.4	0.2	0.0
111	0.0	0.0	0.0	0.0	0.0	0.0	0.0

K = Kale fed.
* = Kale withheld between 23.2.61 and 4.3.61.

Random samples of blood from further animals fed approximately 40 lb. of kale and over were examined and these also contained a variable proportion of Heinz bodies. Less than 0.5 per cent. of the erythrocytes of 2 rabbits fed kale *ad lib.* for 6 weeks developed Heinz bodies but unfortunately this experiment was performed when the kale was in flower (out of season) and this may have contributed to the poor response.

These observations are recorded because it is felt that the presence of Heinz bodies might be a useful test for the detection of the toxic principle in kale. An *in vitro* technique for substances producing Heinz bodies is described by Wintrobe (1956). Their presence might also be used as an aid in diagnosing clinical cases, but the importance of using freshly drawn blood must be emphasised.

Yours faithfully,
R. H. C. PENNY,
J. E. DAVID,
A. I. WRIGHT.

Departments of Medicine and Surgery,
University of Bristol,
Veterinary Field Station,
Langford House,
Langford,
Nr. Bristol.
July 21st, 1961.

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SMITH, R. S., BODDINGTON, M. M., SPRIGGS, A. I. (1958). *Nature*. **182**. 455.
WINTROBE, M. W. (1956). "Clinical Haematology." 4th ed.

GENERAL

Blood Transfusion in Veterinary Practice

Sir,—I was most interested to read the comments of Mr. Douglas and others of the Cambridge Veterinary School (*Vet. Rec.* **73**. 705) on our paper. Their points are interesting and represent clearly the inevitably different approach of the clinician and the laboratory specialist. I am aware that the paper is lacking in clinical detail, but as laboratory workers Mr. Franks and I were unable to include this matter without extensive quotation of the experience of colleagues. Since this paper was written for and delivered to a meeting which consisted in large part of clinicians, emphasis was placed mostly upon those aspects of our subject which would be least well known to the audience. Further, an effort was made to avoid recommendation of procedures which cannot be advised in the present state of laboratory knowledge.

To deal with the specific points raised the following comments may be made.

It is not a fact that ". . . the quantity of blood transfused and the rate of administration depend *entirely* (my italics) on the condition of the patient," unless it is meant to indicate by this phrase that the results of laboratory tests are included. The clinical condition of a patient considered alone might lead to quite incorrect therapy since it would be impossible to decide, for instance, between infusion of whole blood or plasma. Furthermore, since it is presumably the object of modern surgery to minimise both trauma and haemorrhage I am surprised that transfusion is apparently frequently needed. In accident cases complicated by extensive haemorrhage Mr. Douglas and his colleagues are clearly correct and it may be necessary to transfuse large volumes of whole blood.

It is indeed perfectly possible to transfuse large volumes of blood very rapidly to subjects suffering from severe haemorrhage. It is not optimal to do so. The possibilities of variations upon the recommendations given in the paper must be almost infinite, but an effort has been made to select those which appear to be preferable upon theoretical grounds and upon the results of physiological experiments. The practice of transfusing surgical cases with enough blood to replace the lost volume and exceed it by about 15 per cent. is quite satisfactory. The best results will be obtained when this is given by slow intravenous drip.

It is true that the paper does not include extensive discussion of the treatment of surgical shock since this would have required much extra space, although this matter is mentioned in our fourth paragraph (*Vet. Rec.* **73**. 657). While surgical shock might be associated with frank haemorrhage this is not common. Haemorrhage alone would be likely to produce primary shock which is, of course, entirely different from surgical shock. The latter is at least partly caused by suprarenal failure and complex nervous changes associated with trauma, and these processes cause (among other effects) an increase in capillary permeability. Severe depletion of plasma volume follows—there is little or no loss of erythrocytes. In these circumstances logical therapy aims at expansion of the blood plasma volume.

Mr. Douglas and his colleagues are fortunate that they have seen no deleterious effects attributable to overtransfusion. Perhaps they have not yet seen cardiac failure from over-rapid or over-extensive increases in the circulating blood volume.

So far as the suggested maximum volumes of blood for transfusion are concerned, reference to the paragraph on page 661 may be made: ". . . *it is a general rule* (my italics) not to exceed 1 litre . . . in the larger species . . ." Where a large animal has lost so much blood that considerable increase in circulating red cells is indicated, then transfusion of packed erythrocytes (or at least the cell-rich fraction of "sedimented" blood) is preferable. In general it is better to provide enough circulating erythrocytes to support physiological processes with the patient at rest, and not to aim at complete restora-

tion, since extensive transfusion in such cases tends to depress the erythropoietic activity of the bone marrow. Supportive therapy would of course include provision of large amounts of iron.

The object of this paper was to draw the attention of colleagues to some of the laboratory and experimental considerations which are implicit in the use of blood for transfusion. It is suggested that this operation is not suitable for routine use unless adequate laboratory facilities are available, but it is also suggested that blood transfusion can be a life saving measure. For those without immediate access to laboratories, transfusion of blood might be regarded as an acute treatment for an acute condition.

Finally, I am glad that Mr. Douglas and his colleagues have written to you, Sir, giving us the benefit of their clinical and surgical experiences. It is only by discussion and co-operation between the clinician and the laboratory specialist that advances in therapy can be made and any moves in this direction are more than welcome.

Yours faithfully,
R. K. ARCHER.

Equine Research Station of the Animal Health Trust,
Balaton Lodge,
Newmarket,
Suffolk.
July 20th, 1961.

A Register of Veterinary Specialists

Sir,—In the medical profession specialists have long been accepted as essential to both the public and their colleagues. They achieve their status because of hospital, teaching or research appointments. These they can only get after following a recognised apprenticeship and passing a stiff higher examination.

In spite of the fact that our work is getting more complicated and technical, we have not yet really reached the stage of having recognised specialists. Many of the leaders of our profession, mostly in full-time teaching and research jobs do, however, act in a consultant capacity.

I think that it would be generally agreed that many of us in general practice would give a better service to our clients if it were easy to refer difficult cases or rare conditions to recognised consultants.

The honest veterinary surgeon is never ashamed of admitting he does not know the answer to a difficult clinical problem, and he is grateful for help in carrying out an unfamiliar procedure. Similarly, the public welcomes, and is usually prepared to pay for, a second opinion. Indeed, they will soon, as in medicine, come to expect any animal that does not respond rapidly to treatment to be "sent to the specialist."

The profession must both recognise the need for, and welcome the development of this trend. We must be prepared to pool our resources, discuss cases and begin to build up a system of specialists and consultants.

Only by evolving in this way can we continue to give the public the skilled and efficient service it deserves—and expects.

Not only are the days of the one-man band wagon covering every disease suffered by cattle and canaries passing. The single handed veterinary surgeon, like the single handed doctor, cannot now give a good service 6½ or 7 days a week. The future of our profession lies in the development of team work at all levels. This may well lead us into the necessity of making an agonising reappraisal of the contribution, particularly in the field of post-graduate training, that can be made by well-run animal welfare clinics; even if this involves much closer co-operation with certain voluntary associations.

Yours faithfully,
JOYCE GRANT WRIGHT.

114, Maida Vale,
London, W.9.
July 20th, 1961.

Hypothermia in the New-born Puppy

Sir,—The letter from Mr. Hime on *post-partum* hypothermia in the new-born puppy is most interesting. It is pleasing to find other workers developing an interest in rectal temperatures in this new-born mammal. It is also intriguing to realise how little information is available on clinical norms of the neonate puppy.

Too much, however, should not be interpreted from the recent article under my name. The object was simply to record the probable normal rectal temperatures in healthy puppies from the time they are fully dried and comfortable after birth till the 7th day of life so that subsequent work could be based on this published material.

I should like very much to discuss several of the points which Mr. Hime raises, but since this would at present demand more space than is reasonable in a letter, it may be better if this is delayed pending an article which is in preparation.

Yours faithfully,
GEORGE W. CRIGHTON.

132, Lichfield Road,
Stafford.
July 22nd, 1961.

Public Relations and the Veterinary Profession

Sir,—Most of us are aware that there are innumerable subjects on which our profession should explain its point of view for the benefit of other organisations or for the information of the layman. Many subjects would be better understood if they received such treatment, for example, those associated with food hygiene, preventive medicine, the advisory services and even the matter of veterinary fees. We know of course that a great deal of work is already done in this respect by our professional bodies but surely there are ways in which we could help them and thereby help ourselves?

If we consider the methods employed by commercial advertisers we must realise that the public is becoming more and more receptive to educational material that is presented to them in an entertaining manner. It would therefore be reasonable to suppose that if we have any particular point that we require to stress then we should use a comparable means—if we can afford it. Obviously we cannot

afford very much but we could afford to encourage those amateurs who are prepared to produce visual material and—what is more important—to do something about using the material they produce. Unfortunately the mechanics of making a film or taking a photograph occupy a great deal of time so that the full utilisation of the material produced is never achieved. I hope therefore that colleagues who are not necessarily photographically minded but who are interested in public relations work will attend the photographic meeting at the B.V.A. Congress with a view to helping with the utilisation of the material which is available. The meeting is scheduled to take place at 3.45 p.m. on Tuesday, September 5th, in the Physiology Lecture Theatre.

Yours faithfully,
P. R. GREENOUGH.

Florida Cottage,
Castle Cary,
Somerset.
July 20th, 1961.

Serial Transaminase Tests and the Treatment of Virus Disease in the Dog

Sir,—Recently we encountered a natural outbreak of Rubarth's disease (canine viral hepatitis) in a litter of Greyhound puppies aged 14 weeks. Serum glutamic-oxaloacetic acid transaminase activities were greatly increased, unlike any case of the distemper-hard-pad complex we have yet tested. This test, or better still where available an estimation of the serum or plasma glutamic-pyruvic acid transaminase activity, appears to provide a quick differential diagnosis between the two diseases (Mallucci & Mantovani, 1959; Hoe, 1961). Possibly it might even provide more direct evidence of the nature of the "fading puppy syndrome."

We believe that serial transaminase tests could provide a useful prognostic test, a method of evaluating both the efficacy and virulence of a vaccine, and perhaps even provide more detailed information on the dose and efficacy of antiserum and other antiviral agents in the treatment of this virus disease.

Yours faithfully,
G. DAVIES,
C. M. GOULD,
F. C. GRIMES.

12, Landguard Road,
Southampton.
July 14th, 1961.

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MALLUCCI, L., & MANTOVANI, A. (1959). *Atti Soc. ital. Sci. vet.* **13.** 729.

Treatment of Sprained Tendons in the Horse

Sir,—Following the publication of my article on the treatment of sprained tendons in the horse (*Vet. Rec.* **73.** 627) I received very many letters from members of the profession. I am sorry to have to admit that in matters of private correspondence I am not the most punctilious of men: I am rather apt to allow letters to accumulate and then to try to answer them all at one fell swoop. I do try, and certainly intend, to answer all letters but unfortunately—as a result of my somewhat unorthodox system—it may happen either that I answer some letters twice or that I fail to answer the odd one which goes astray.

If either of these things has happened on this occasion I do wish to apologise to the injured parties.

Yours faithfully,
J. P. PICKERING.

Orchard House,
Priestpopple,
Hexham,
Northumberland.
July 18th, 1961.

Prolapse of the Uterus in the Cat

Sir,—At the risk of perpetuating the correspondence relating to uterine prolapse in domestic carnivores, the following is of interest if only to demonstrate the resilience of the species in question.

A lean muscular multiparous 6-year-old queen was presented showing moderate lethargy and some dehydration. The cat had produced one live kitten 4 days previously on the Thursday, one on the Friday, and on the Saturday morning the owner noticed a double tubular structure projecting behind the cat. It was not until the Monday when a fall in appetite and listlessness became obvious that the cat was brought for treatment. It was rather weak, tachycardic with a weak pulse, had a subnormal temperature but seemed fairly alert. A "V"-shaped structure, its arms 5 and 7 cm. long and about 2 cm. diameter projected from the vulva. These were quite pale, transversely ridged and showed little evidence of haemorrhage. They were somewhat turgid, moist, and not blackened, dry or necrotic as might be expected.

A flank laparotomy was performed under pentobarbitone and cyclopropane anaesthesia. Two taut bands of uterine horn could be seen with the ovaries scarcely 1 cm. in front of the pelvis. With an assistant compressing the lubricated prolapsed horns, one in each hand, a steady tension was placed on the ovarian ends *via* the incision. Very slowly over a period of 5 to 8 minutes of combined posterior compression and anterior differential traction, the uterus was fully involuted and a complete ovarohysterectomy was performed by orthodox methods.

Even allowing for some errors in interpretation of observations on the part of the owner, the protracted course of this case is probably beyond doubt. The slow onset of shock, minimal uterine changes and rapid recovery after surgery are surprising. The cause of the condition in this animal is probably multiple: flaccidity of myometrium or attenuation of mesovaria due to over-breeding, with prolonged second stage labour for the same reason or because of possible relative oversize of the two kittens may have been factors. The condition remains somewhat of a rarity and an enigma.

Yours faithfully,
LESLIE ARNALL.

Veterinary Hospital,
2, Pembroke Gardens,
Liverpool, 3.
July 24th, 1961.